A Feasibility Study on Qualitative Indicators in Isfahan City

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Introduction

Quality of urban life is known as one of the major elements of urban development. Thus, evaluation urban environmental quality has much importance in the planning of urban development. Cities are complex ecosystems affected by social, economic, environmental, and cultural factors. Inefficient urban planning and management and lack of coherent environmental policies have led to many urban environmental problems in a lot of modern cities. The number and scope of these problems are significant and they are becoming serious threats to the health and safety of residents.

Environmental damages in large cities of Iran such as Isfahan have threatened health and welfare of the residents. Therefore, evaluation of environmental elements quality in Isfahan city for identifying the current state of environment is necessary. Thus, the main objective of this study is to measure qualitative indicators in different fields using urban environmental quality evaluation model in Isfahan city.

Recent experiences for providing the analytical methods in urban environmental quality evaluation have shown the worth of indicators.

Therefore various collections of indicators have designed for evaluation of urban environmental quality. The Foundation's work on urban sustainability indicators started in 1994 when some researchers proposed a set of indicators based upon the charter of European sustainable cities and towns. The framework was subsequently tested by the cities participating in the research network of medium-sized cities. In another research, the Sustainable Society Index (SSI) has been developed for use in 135 different countries. The SSI integrates the most important aspects of sustainability and quality of life of a national society in a simple and transparent way. In another research, urban sustainability is evaluated by 19 indicators in four cities in China. Although, all four cities are moving towards sustainable development, the current situation shows still weak sustainability in three cities and even non-sustainability in one. Researchers in Italy used the Dashbourd of Sustainability to measure the local urban sustainable development. 61 various indicators has presented in their work. The Dashboard of Sustainability (DS) is a mathematical and graphical tool designed to integrate the complex influences of sustainability and to support the decision-making process by creating concise evaluations. In a similar study, 51 sustainability indicators have selected for evaluation of the urban characteristic of Taipei city. These indicators are classified into economic, social, environmental, and institutional dimensions. Analysis of the results demonstrates that social and environmental indicators are moving towards sustainability indicators, while economical and institutional dimensions are performing poorly. Some of the best foresaid have been used appropriately in order to evaluate urban environment in Isfahan. Iran has recently paid special attention to evaluate the urban environmental quality by the use of various indicators too. In a main study, after reviewing traditional methods, a model has been presented for evaluation of urban environmental quality. On the other hand, quantitative and qualitative characteristics of Tehran's environmental quality were evaluated as average with a score of 53.3% in a similar study that was conducted in 1996. After that, Tehran's urban environmental quality has been evaluated again by reforming and optimization of previous indicators.

In this study, application of urban environmental quality evaluation model had been tested based on various urban quality models and indicators in Iran and the world. The recent model and indicators along with some modifications had been adopted for use in the evaluation of Isfahan city.

Materials and methods

The case study is 14 urban districts in Isfahan city with an expansion of 482 kilometers and a population of 1.7 million people.

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In the present study the various kinds of patterns and models of sustainability indicators have been studied for evaluating the quality of urban environment of Isfahan. Also, urban environmental quality evaluation model and its application which had been tested in evaluating the quality of Tehran's urban environment have been compared. Then, the final collection of indicators for evaluating the quality of urban environment in Isfahan had been collected, with comparative analysis of the mentioned studies and the various indicators of international researches.

In the first step, the various indicators of different countries have been extracted. In the next step, the similar indicators with Iran's indicators have been removed. Thus, in the following stages the mentioned indicators were adjusted based on the current information. Finally, a collection of 11 indicators and 53 measures have been chosen and categorized in the form of the adjusted model of the previous studies. The model with a simple mathematical order, determines the quality of urban environment to the language of numbers based on compared common criteria. The model contains four layers and the main indicator is at the first. There are sub indicators in the second layer. It was divided to elements. Finally, the third layer consists of the measures. As it is observed, the measures are the smaller form of the indicators of the higher layers which can be measured. For evaluation, the information has been collected from various studies such as Isfahan city statistic yearbook and other organizations.

Results

Table 1 has shown the quality of urban environment for the 11 main indicators.

Table 1. Eleven main indicators of Isfahan's environmental quality

Main indicators	score	Condition
Natural environment	73%	Desirable quality
Individual health & treatment	93%	very desirable
Safety & security	40%	Middle ranking quality
Social environment	43%	Middle ranking quality
Education	85%	very desirable
Economy & employment	66%	Desirable quality
Service centers distribution	75%	Desirable quality
Urban facilities	91%	very desirable
Transportation	81%	very desirable
Housing	58%	Middle ranking quality
Culture, Art, Recreation	%63	Desirable quality

In the natural environmental indicator, the city's desirable quality was due to air pollution, daily water use per capita, number of regular water outage, permanent or seasonal status in the Zayandeh Rud river, quality of soil, soil pollutant, average annual rainfall, average temperature with scores of 83%, 75%, 100%, 50%, 50%, 100%, 0%, and 50%, respectively. In fact the main problem in this section is related to the undesirable quality of average annual rainfall. Also, though the desirable quality of air pollution, high density of Pm_{10} is a big challenge in this city. Furthermore, soil's desirable condition is due to low density of heavy metals.

Best quality in the individual health and treatment indicator was because of high percentage of children vaccination with a score of 100%, percentage of specialists, practitioners and assistances of doctors with a score of 100%, the necessary number of specialist and general hospital and clinic with a score of 88.8% and also low amount of pulmonary tuberculosis and malaria diseases with a score of 75%.

In the safety and security indicator, the city's middle ranking quality was due to the high states of car accidents with a score of 0 % and high quality of the minimum time for helping fire stations to casualties with a score of 75%. Middle ranking quality of social environment indicator was because of high divorce rate and desirable quality for family size with 0% and 100% scores. Best quality of education indicator was because of illiteracy rate with 80% score and 100% score of radio and television coverage across the city. Desirable quality of employment indicator was because of unemployment rate, inflation rate, and gini coefficient with scores of 75%, 50%, and 75%, respectively. Desirable quality of public service centers distribution was because of distribution of vegetable and fruit district's bazaars throughout the city with a score of 75%. High quality of urban infrastructures was due to phone landlines with a score of 100% and wastewater piping networks with a score of 100% (because of Isfahan's urban ago system), desirable quality of information technology centers and

recycling house of waste with a score of 66% on the other hand. High quality of transportation indicator was because of using public transportation for intercity travelling with a score of 83%, the desirable quality of average of expectation for buses in stops and share of bicycles in intercity travelling with a score of 66% (because of traditionally using of bicycles in Isfahan city), and also desirable quality of public transportation per capita with a score of 75%. Middle ranking quality of housing indicator was because of the number of family's ratio to housing units with a score of 50% and average size of housing units with a score of 66.6% in this indicator. In the main indicator of art, culture, and recreation, the city's desirable quality was due to library usage per capita with a score of 25%, the number of museums per 100000 people with a score of 33%, and the importance ranks of historical heritages with a score of 100%.

Conclusion

The most important result and the main difference of this study with previous ones is comparative analysis of urban indicators presented in different countries. At first, some of the newest studies and similar experiences for evaluating urban environmental quality have been extracted. In the next stage, aforesaid indicators have been studied. Thus, a collection of useful indicators has been collected and categorized. It caused to update the indicators method. Hence, validity and stability of this method has been verified because of its use in different cities and the measuring capability of necessary characteristic via these indicators.

Keywords: indicators, Isfahan, quality, urban environment.